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$$=\frac{8r^2}{\pi^2}\int_0^{\frac{1}{2}\pi}(\tfrac{1}{8}\pi^2+\tfrac{1}{2}\theta^2-\tfrac{1}{2}\pi\theta+\tfrac{1}{2}\cos^2\theta-\tfrac{1}{2}\pi\sin\theta\,\cos\theta+\theta\sin\theta\,\cos\theta)d\theta=\tfrac{1}{6}\pi r^2.$$

Second Case. The two chords AB and $A'B'$ may be on *different* sides of the diameter XY; that is, the chord $A'B'$ now becomes the chord MN in position.

$\therefore$ Area $AMNB=U_2=(\phi+\theta+\sin\phi\,\cos\phi+\sin\theta\,\cos\theta)r^2$; and consequently,

$$A_2=\frac{\int_0^{\frac{1}{2}\pi}\int_0^{\frac{1}{2}\pi}\int_0^{\frac{1}{2}\pi}\int_0^{\frac{1}{2}\pi}U_2 d\theta\,d\phi\,d\omega\,d\psi}{\int_0^{\frac{1}{2}\pi}\int_0^{\frac{1}{2}\pi}\int_0^{\frac{1}{2}\pi}\int_0^{\frac{1}{2}\pi}d\theta\,d\phi\,d\omega\,d\psi}$$

$$=\frac{4r^2}{\pi^2}\int_0^{\frac{1}{2}\pi}(\tfrac{1}{8}\pi^2+\tfrac{1}{2}\pi\theta+\tfrac{1}{2}+\tfrac{1}{2}\pi\sin\theta\,\cos\theta)d\theta=\tfrac{1}{2}(\pi+1/\pi)r^2.$$

$\therefore A=\frac{1}{2}(A_1+A_2)=(\frac{1}{3}\pi+1/4\pi)r^2$, which is the required average area.

Corollary. If $r=1$, $A=\frac{113}{314}$; that is, the required average is slightly greater than one-third of the given circle.

CALCULUS.

201. Proposed by **F. P. MATZ, Sc. D., Ph. D.**

Solve $\int\int_0^{dy/dx}\frac{dw}{1+w^2}=0$.

Solution by **G. B. M. ZERR, A. M., Ph. D.**, Parsons, W. Va.

$$\int\int_0^{dy/dx}\frac{dw}{1+w^2}=0.\quad \int\Big[\tan^{-1}w\Big]_0^{dy/dx}=0.\quad \therefore\int\tan^{-1}\frac{dy}{dx}=0.\quad \therefore\frac{dy}{dx}=0.$$

$y=C=$a constant.

202. Proposed by **W. J. GREENSTREET, M. A.**, Editor of the Mathematical Gazette, Stroud, England.

Find the complete primitive of $y=2px+ap^2$. Regard the primitive as the equation giving the arbitrary constant, and if the primitive has equal roots discuss the equation expressing that condition.

Solution by **G. W. GREENWOOD, M. A.**

Differentiating with regard to x we obtain an equation which may be written

$$p\frac{dx}{dp}+2x=-2ap.$$

Integrating, we have $3p^2x+2ap^3=c$, where c is a constant. Eliminating p between this equation and the original equation, we get